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ARE WE REALLY IMPROVING READING IN THE CONTENT FIELD?

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Studies representative of research in content area reading provide extensive but inconclusive evidence of the extent and effectiveness of reading in the content areas. Some of the studies reviewed in this paper illustrate gains made through special instruction in reading in the content areas. They point up the need to integrate reading instruction with subject matter and suggest that the content area teachers are best equipped to teach the reading and study skills needed in their respective content areas. The other studies cited are attempts to examine the relationship between general and special reading abilities, the readability of instructional materials used in the content areas, and the efforts made in the language arts to improve content area reading. There is need for better research in teacher training, in relating subject matter objectives to reading objectives, in providing adequate materials, in grouping for instruction, in the assessment of outcomes, and in the development of guidelines for administration and supervision of content area reading programs. A list of references is included. (NS)

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ARE WE REALLY IMPROVING READING IN THE CONTENT FIELDS?

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It is difficult to evaluate the extent and the effectiveness of reading in the content fields. There are few comparative studies which attempt to show the superiority of reading in a subject area in relation to reading in a special developmental program. There have been few studies which have attempted to appraise a total school effort. However, the sheer volume of studies dealing with reading in a variety of content areas or concerned with problems of reading in content areas is sufficient to warrant the opinion that something good is going on. Exactly how good this effort is or how extensive it is remains relative but is probably a definite improvement over the situation a decade ago.

The literature on this topic falls generally into three categories:

1. Expository or descriptive articles which urge, recommend or demonstrate the application of reading principles in the content-area fields. These are numerous and unfortunately repetitious; but their continuing appearance in our own journals, in other professional journals, and on the programs of professional conferences is evidence that the message is being presented.

2. Individual studies relating to various specific techniques, applications or problems involved with reading in special content areas. Some of these are action research and others are more ambitious, well-controlled studies of individual problems or whde-school efforts. Most of these are done by people with an avowed interest in reading.
3. Investigation by content-area people themselves relative to the reading ability of their students and readability of their own texts--additional proof that the subject-matter teachers themselves are involved with this problem.

The evidence is extensive but inconclusive. If the objective is to make every content-area teacher concerned with reading instruction as it relates to his subject-matter and somewhat knowledgable regarding techniques and methods, then it is almost impossible to assess the degree and the quality of growth. What we have in the literature does confirm a high degree of interest on both sides--from reading specialists advocating, recommending and demonstrating how content-area teachers may extend good reading practice and from subject-matter teachers themselves investigating matters of personal interest. Nonetheless the studies are scattered and uncoordinated, probably representative of a relatively small portion of the profession.

Nor can these studies be categorized to permit any general conclusion. They cover all levels from fourth grade to college; they examine efforts in almost all subject-matter areas with English, social studies and science predominating; they investigate behaviors as diverse as word analysis, vocabulary, purposeful reading, the relationship between literal and critical reading, both general and specific; they are produced by reading specialists and by content-area people. Other studies appraise the quality of content-area preparation for reading instruction, the general role of the content-area teacher,

the kinds of reading practices involved with subject-matter teaching. Others describe and attempt to appraise efforts to convert whole departments and schools to the need for improved reading instruction in the content areas. Specific findings, however, are limited and forbid generalization. They are frequently clouded by faulty methodology or analysis, recognized limitations, and conclusions which have minimal application. They, nevertheless, indicate a relatively high degree of interest, increasing sophistication and focus on research efforts, and undoubtedly effect wider influence--particularly among other content-area teachers--than pragmatism or optimism might recognize.

The studies presented here, therefore, are selected more as representative of what is going on in research than as proof of quality; the conclusions cited demonstrate tendencies to this point and directions for the future.

The first set of studies reviewed demonstrate a variety of efforts being made to assess content-area reading and indicate that the classroom teacher may be better equipped to deal with some reading problems than a special reading teacher might be.

General Studies

One of the earliest studies of reading in the content-areas was done by Eva Bond in 1938 (4). She investigated the relationship between general reading ability and achievement in specific fields for three-hundred ninth-grade pupils. Using principally a series of Cooperative Tests (English, Literary Acquaintance, Latin, General Mathematics, Algrbra, General Science) and the Iowa Silent Reading Test and the Traxler for reading ability, she sought the answer to the questions "How well does a good general reader perform in English, Latin, math, and science?" and "Does he perform equally well in all other subjects or are some subjects more directly benefited than others?" She concluded that "There is no such thing as a critical level of reading ability

above which added improvement in reading is no longer a factor in achievement at the ninth grade level.' Her findings "indicate that any increase in reading ability will be reflected in increased scholastic achievement." She states that her study supports the statement that "Every teacher should be a teacher of reading."

Fay (9) described several experiments in which classroom teachers attempted to apply reading to their specific content field. One of these will serve to represent what can be done by the interested teacher.

A fourth-grade teacher used her entire class of 45 children in an attempt to see how much gain could be made in arithmetic reasoning in one semester as a result of special emphasis on reading skills and vocabulary. She employed the Stanford Achievement Test, Form J, to determine the ability of the students to handle paragraph comprehension and arithmetic reasoning. The results showed a range in reading ability from 1.7 to 8.6. The teacher stressed skill and comprehension with her pupils and gave apecific training in the following skills: skimming to find the answer to a specific question, skimming to get a total impression, reading to grasp the main idea, reading to follow sequence of events, reading to note and recall details, following directions, critical reading, and remembering what one has read. A special drill was given in vocabulary along with computational skills.

Using another form of the Stanford Achievement Test, the teacher assessed the improvement the students made at the end of one semester of the experiment, that is, four months having lapsed between the two tests. Results indicated a substantial gain in both paragraph meaning and arithmetic reasoning. On the second test, 22 pupils, or 49 per cent of the class, were performing at fifth-grade level and above in paragraph reading. 24 pupils or 53 per cent of the class were performing at fifty-grade level or better in paragraph reading. The

class median gain in paragraph reading was six months. The median gain for the class in arithmetic reading was 9 months which was equal to twice the time spent in the experiment.

A careful study by Krantz (13) re-enforces the essential role of the content-area teacher in development of reading and study skills. In a comparative longitudinal study he examined the relationship of reading abilities and basic skills of the elementary school with success in the interpretation of context materials in the high school. Through school records and specific testing, he obtained massive data on 471 pupils: 215 as seventh graders in 1947 and again as eleventh graders in 1952; 256 as seventh graders in 1949 and again as ninth graders in 1952. He used a wide variety of instruments and analyzed his variables through zero-order correlation and multible regression. Among his many conclusions, he noted that (1) development of reading ability specific to a content area is highly important to pupil achievement in the elementary and secondary school; and (2) in general, it is highly important to analyze the content fields and find related study skills, as yet unmeasured. By implication, he indicates that the content-area teacher is best equipped to deal with these reading and study skills.

Melis in 1964 (16) surveyed 177 intermediate-grade teachers to discover their use of "approved" reading apprcaches in the field of science and social studies. He listed sixteen areas; 177 or 84.1 per cent of the teachers responded. He noted the following: (1) application of "good reading practices" are more frequent at successively higher grade levels; (2) they are more common among social studies teachers than science; (3) the years of experience of a teacher is not a significant factor in determining methods; (4) advanced training and preparation is not significantly related to difference in method; (5) teachers appeared to follow the recommendations of experts in using available materials.

This obviously is the kind of information that we need. Unfortunately this study leaves much to be desired; its total methodology and treatment of the material is inadequate to provide us with very much guidance. It does, however, give some hint of the need and possible application.

Another important area of concern in intensifying reading instruction in the content areas is the possible value of in-service work done by reading consultants. In 1963, Zepp (26) attempted (1) to identify basic reading and reading-study skills to be emphasized in subject-matter classes of grades seven and eight; (2) to help teachers formulate ways to assist pupils to develop these skills in grades seven and eight in English, history, geography and science; (3) to show how a curriculum coordinator can do good in-service work with subject-matter teachers; and (4) to see if these efforts bring any improvement in pupils' involvement in the program.

Zepp administered silent reading test, work study skills tests, and social studies and science achievement tests to all seventh-grade pupils in September of 1958; he retested them at the end of the eighth grade. In the meantime, he held monthly planning sessions with the seven cooperating teachers in an attempt to make teachers more sophisticated in the reading areas applicable to their subject matter. The results are reported in terms of decile improvement with no statistical test. For example, from the beginning of the seventh to the end of the eighth grade, 53.9 percent of the students involved gained in silent reading skills, 12.9 per cent regressed and 33.2 per cent showed no gain. The other improvements were similarly reported. He does suggest, however, that the following reading and study skills are valuable: pronunciation, word meaning, basic locational and reference skills. He concludes that junior high school teachers without specialized training in the teaching of reading can be guided through in-service programs to develop an understanding of basic reading skills in the regular subject-matter classes.

It is regrettable that this study, so very promising, should have serious deficiencies. We note the lack of a control group, of statisfical verification, the failure to specify the nature of the gains or the effect on the content-area served. Little is said with regard to teacher aptitude, cooperation or attrition, or of the time involved. Nevertheless, it is studies such as this, if properly conducted, which will reveal to us the real degree and nature of improvement of reading in the content fields.

Smith (23) reported a year-long "experiment" in cooperation toward reading improvement by English, general science and social studies departments of a New York high school. It was designed to evolve a method to improve the reading and the writing skills of ninth-grade students. The procedures as outlined are excellent and such as should be employed in any departmental effort. Actually the report involves nothing more than affirmative observations as to the value of the work, the degree of cooperation which existed, and the personal satisfaction on the part of the teachers. Again it is regrettable that fuller information is not given with regard to the cooperation of the teachers, the varying degrees of cooperation from one department to another, and the strength of leadership involved in the total program. It is interesting that the general science teachers who participated in the program claimed that they sacrificed almost one-half of the usual content time in order to conduct the reading exercises involved. This experiment is likewise illustrative of the possibilities but it provides us with very little evidence for evaluation.

These several studies indicate some of the difficulties involved in any attempt to involve all departments of a school in a totally integrated and cooperative reading effort. A study by Braam and Roehm (5) points up others difficulties in enlisting the full cooperation of subject-matter teachers in

in reading development. Working on the premise that knowledge of reading skills necessary for successful reading of subject-matter materials is a prerequisite to teaching the students to effectively read such material, they sent a questionnaire to the non-reading teachers of sixteen high schools; they received seventy returns. The investigators noted: (1) considerable discrepancy between conception and knowledge of reading skills of subject-area teachers and of experts in reading; (2) the thinking of reading experts is not being effectively transmitted to subject-area classroom teachers; (3) teachers seem more aware of student incompetencies than of competencies; (4) mathematics and English teachers are generally most responsive to the question of reading skills; (5) formal or in-service training does not appear to increase the awareness of reading skills necessary for successful reading in the subject areas; (6) the existence of a reading program and the presence of a reading specialist does not seem to have much effect on the subject-matter teacher's awareness of the student needs. Braam and Roehm concluded that it is evident that communication between experts and classroom people is not being effected through existing channels of professional writing, instructional programs in the teaching of reading, or by reading specialists in the schools.

These studies, then, do represent the need and the possible gains which may result from increased effort in the content areas. They demonstrate that individual teachers with good will can effect improvement, that the content-area teachers are best equipped to deal with some kinds of reading problems; that teachers of allied content areas may work cooperatively together; but that there appears to be a great lack of sophistication in reading techniques among content-area teachers and, in general, no concerted effort to integrate reading instruction with subject matter.

More Specific Applications

The following studies represent efforts at several levels and in varying reading behaviors and subject matters toward improvement of content-area reading.

Several studies--even some recently completed but yet unpublished--indicate that word analysis on the study of word parts is the best technique or approach for vocabulary development in the content fields. Severson (20), for example, reports that an experimental group made 17 per cent better gains in vocabulary than did the control group when vocabulary was attacked through study of prefixes, suffixes, roots and meanings in biology.

In 1961 Koester (12) investigated fifty 6th-graders to discover differences in reading science material for two specific purposes. He developed two tests of purposeful reading, each consisting of a series of twenty different expository passages in science. Group A was instructed to read to understand step-by-step directions; Group B, to find the best explanation of the events. The passages were administered two each for ten successive school days. Both groups took the same comprehension test and recorded their self-perceived reading behaviors. Koester found no significant differences in rate or comprehension between the two groups. Students with high intelligence and high science achievement scored better. In all, although the real differences are not clear, there seemed to be no notable difference as a result of varying the purpose for reading. (Unfortunately no reliability data is supplied on his instrument and the statistical details in the abstract are inadequate.)

Likewise working with sixth graders, Shores (21) found that they were not clear in their own minds as to their purposes in reading or how to apply the purposes. In yet another study, he (22) reported that pupils do vary their performance with different kinds of material read for defined purposes.

The relationship between awareness of structural relationships in English and ability in reading comprehension was tested by O'Donnell (17). Using a self-constructed test and the Cooperative Reading Test, Form Z and the Iowa Grammar Information Test, Form A with 101 senior high students, he found sufficient evidence to recommend the teaching of linguistic structure rather than traditional grammar as a major means of developing reading comprehension.

Forseth (10) found that tenth-grade pupils who study geometry improve in reading ability more than do their classmates of equal initial reading ability and intelligence who study subjects other than geometry. He reported significant gains with geometry students whereas similar comparisons made for biology, home economics and industrial arts yielded gains which were not significant. Forseth offers no rationale for this phenomenon.

Seeking the characteristics of the social-studies reader, Covell (8) tested 101 eleventh-grade American History students. He selected the ten best and the ten poorest for intensive case study. The good social studies reader in general: (1) has a broad knowledge of technical vocabulary; (2) understands time and place concepts; (3) shows strength in general and technical vocabulary and in sentence and paragraph comprehension; (4) has average or better intelligence; (5) comes from a middle or upper-income home; (6) has liberal social views and is active in school; (7) likes reading.

In contrast, the poor reader is at the opposite end of this continuum in all of these characteristics and is usually at least one year retarded in school. Unfortunately the investigator did not rank these characteristics or show their interrelationships. Nonetheless, the advice and evidence here afforded to social studies teachers could serve to strengthen their instructional approach.

Relationship between General and Special Reading Abilities

One of the disturbing aspects of studies of reading in the content fields is the occurrence of conflicting or at least non-corrorborating evidence. This

is quite marked in the relationship of general reading ability to more specialized reading competencies. Perhaps agreement should not be expected since different instruments and methods are employed and few of the studies reflect similar controls or purposes.

Troxel (24), for example, in studying "The Effects of Purpose in the Reading of Expository Math Material in Grade 8" found that speed and accuracy of reading are influenced by the purpose of reading, and that those who read expository math material faster and with greater accuracy also tend to achieve higher scores on general reading ability tests. There is nothing surprising about such a conclusion.

Cooper (7) found science-reading ability to be equally related to general vocabulary, English vocabulary, social studies vocabulary and science vocabulary with correlation coefficients ranging from .66 to .85. He concluded that reading ability appears to be largely an expression of a student's total intellectual and language development and that differences are not specifically related to differences among their associated vocabularies. He states that "relatively minor degrees of independence existing among different reading abilities and among different samples of vocabulary are associated with subjective attitudes toward the various subject areas."

Artley (2) in testing 200 eleventh-grade students reports a correlation coefficient of .79 between comprehension in social studies and in general comprehension and implies that improvement in reading in social studies could help general comprehension.

Maney (14) speaks to the value of the science teacher's concern with reading. She investigated the relationship between literal and critical reading comprehension of science materials, between reading comprehension as measured by a reading survey test and that appraised by a literal and critical reading test of science. Using 513 fifth graders and accepted measurement instruments she concluded, among others, that proficiency in critical reading of science materials cannot be predicted from scores obtained (a) on literal reading tests in science (b) on group tests of verbal intelligence of (c) on "general" reading tests; and that proficiency

in literal reading of science can only be partially predicted from the same. She recommends that, since critical reading ability consists of relatively separate abilities, the best procedure for developing critical reading proficiency is by providing instruction in each specific skill. This instruction needs to be systematic and direct.

Similar to Maney, Witt (25) examined both social studies reading in general and in particular ten specific social studies concepts, i.e., ideas of depth and breadth which can be applied to past, present and future. Her subjects consisted of sixty-two seventh graders divided into equated groups, and she employed a variety of instruments with normal empirical controls and statistical care. She concluded that (1) the concept approach to teaching social studies is desirable to develop critical thinking and (2) reading skills are effective when applied to social studies but increased skill in reading does not necessarily mean increased skill in conceptualization of social studies concepts.

Aldridge and Anderson (1) analyzed 300 National Merit Scholarship Tests in Kansas in 1958. From a pool of 7000 available tests, they picked 300 at random--one from each of 312 high school lists. They used correlation and multiple regression analysis with "t" and "f" tests for significance. Their results revealed that ability in natural science reading was accompanied most intensely by abilities in word usage and social studies reading; math usage was the least important factor and English usage (punctuation, spelling, etc.) contributed nothing.

Readability

Most reading authorities urge that content-area teachers take special interest in the readability of the texts they use with students. This one area of reading does seem to be a matter of common concern to all the subject-matter investigators but not always with similar results.

A wide range of studies would seem to confirm that most textbooks and supplementary reference books are beyond the reading ability, in concept load, vocabulary

or both, of the students for whom they are intended. These studies generally have used the Dale-Chall or the Flesch Readability formulas, the latter more frequently and usually without the "human interest" formula. Two studies, however, exercise a caution in the application of readability formulas and in the matter of readability itself--at least in special areas.

Marshall (15) in a most careful study in 1962 set out to discover if a readability formula could predict comprehension of high school physics texts. Because he viewed the use of word lists as prohibitive in physics, he decided to test the Flesch formula. Every accepted empirical caution and control, pre- and post, was observed. He selected a passage on electricity from the most commonly used physics text in New York state and rewrote it to raise the readability. He developed a comprehension test on both passages. He used the Cooperative Reading and the Cooperative Physics tests to determine other variables and eliminated any subject with prior knowledge of the subject matter. Every possible care was exercised; the whole was piloted. Finally 144 matched subjects completed the reading of the passages. He found no relationship between readability and comprehension. Students in the six participating high schools did as well on the test of comprehension after having read the passage with low readability as their classmates did after reading the passage with raised readability. The good readers and the good physics students scored significantly better than their opposites. He concluded that the Flesch formula is not justified with high school physics texts and by extension with other technical and scientific material. This would seem to raise some questions relative to other readability studies of specialized materials.

A study by Blue (3) in 1964 extends our understanding of this matter, apparently indicating that reading difficulty makes no difference in the understanding of scientific reading. Using 240 seventh graders selected at random, he administered

eight science selections of approximately 900 words each with varied difficulty in vocabulary, sentence length and style along with a single comprehension test on the selections and a four-item rating scale. He tooexercised standard empirical controls. He found no significant difference in science reading comprehension between students who read selections containing variations in reading difficulty of at least three years. He suggests that a test of general reading comprehension seems to be a better predictor of science achievement than a test designed to measure general scientific information. By implication, of course, his study points up the concept burden of all reading which cannot be assessed through existing readability measures.

These studies of themselves demonstrate considerable interest on the part of subject-matter professionals regarding the reading ability of their students and the materials being used. The more recent studies cited likewise demonstrate a high degree of critical sophistication in approaching the task.

Large-Scale Programs

To bring this review to some kind of optimistic conclusion, let us briefly examine efforts and results manifest in a single area--the language arts.

In 1957, Wallace Ramsey (18) set out to answer the questions, "Whom, in what classes and by what methods should reading be taught in the high school?" He attempted to present evidence concerning the effectiveness of a reading program with the following characteristics: (1) instruction in regular English classes with no attempt at homogeneous grouping; (2) teaching done by regular English teachers who had received no training in the teaching of reading; (3) reading instruction presented as part of the instrudion in literature; (4) attempted improvement of four important types of reading skills: (a) introduction of the selection, (b) interpreting the selection, (c) extending skills and abilities, and (4) extending interests of the students.

Ramsey set up the program with five English teachers, spending one half a day each week helping the program throughout the school year. He held a series of eight one-hour teachers meetings with several consultants involved. The work itself was conducted with 425 senior high school boys and girls. The English teachers spent 120 minutes a week of class time in the thorough integration of reading, literature, grammar and composition. At the end of the school year the two reading tests were readministered and the amount of growth each student had made in reading was determined. The scores of 138 eleventh-grade students were subjected to statistical analysis, all gains being statistically significant and equally beneficial for students of high and low mental ability, boys as well as girls.

Ramsey reported that two control groups of 78 students each made gains of four percentile points as compared to average gains of thirteen percentile points by the experimental groups. Although the research as reported does raise questions, it is the cooperative effort and the empirical methodology--however limited--which is encouraging.

In separate studies, Ruth Reeves (19) and Robert Clark (6) report similar efforts. Reeves worked with three low eighth-grade classes and three English teachers, three social studies teachers and three science teachers. Clark reorganized the English department into seven non-graded levels, assisting the teachers through in-service programs. Reeves reported most encouraging gains at the conclusion of the year as evidence through standardized tests. But she likewise reports that efforts to renew the program the following year with different teachers were unsuccessful. It had been the control of the experiment, the organization of the group working together, and the focus of interest on improvement in reading that had made for success. Clark too felt that their program had been successful, particularly the enthusiasm and cooperation of the content teachers who responded admirably to information and direction.

Concluding Remarks

The three reports just cited frame quite well the possibilities and the difficulties involved with efforts to improve reading in the content fields. It is difficult to organize, sustain and empirically evaluate any program which permits such a wide variety of almost uncontrollable variables. Yet the efforts continue--although we must admit that we are still in the infancy of the endeavor.

On the other hand, as Walter Hill (11) points out, there are subjective optimistic signs. There is a gradual shift in teacher attitude, marked by growing interest in the problem of reading skills and reading improvement among all junior and senior high school teachers. They are raising questions--questions which cause them to wonder whether anything except a full-scale all-school program will ever improve reading instruction. More and more teachers are recognizing that reading a math problem, a newspaper feature, an industrial design, a dress pattern, or locating and critically evaluating special resource materials is not something apart from the responsibility of every teacher. They know that reading ability and intellectual acumen are complementary. They see first-hand evidence of the high positive correlation between reading ability and academic success. They are finding it more satisfactory to work with poorer students in the classroom, finding materials and methods to fit their needs than to assign them to special reading programs or constantly reassign them elsewhere. Furthermore, they realize the toll failure takes on the morale of the individual student, both his satisfaction in school and his chances on the part of teachers of content subjects. And for those who look, there are a multitude of content-area teachers who are--possibly unconsciously--effecting good reading techniques in their normal daily teaching. For we can take it as axiomatic that any good teacher must be a good teacher of reading in his field.

Others, more knowledgeable than I, agree that research in the area is "scanty" (Traxler), "too varied to permit classification" (Townsend), "generally meager and insufficient" (Summers). There are few completely satisfactory programs which adequately emphasize the teaching of reading in subject areas. Far more and better research is needed: research in teacher training, in the correlation of subject-matter

objectives and content improvement with reading objectives, the provision of adequate materials, grouping for instruction, measurement and evaluation of outcomes, and establishment of guidelines for the administration and supervision of programs once in operation.

"Are we, then, really improving reading in the content areas?" Fortunately I do not have to give any categorical answer to that question. Perhaps my colleagues can justify a confident "Yea" or "Nay"--I admit to a tentative "Maybe". There is ample evidence of interest but certainly what I have here presented can hardly clarify, and possibly may only confuse the issue.

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